little technical as possible. The biology and some elementary points of structure of each group are briefly considered, and useful keys are provided to aid the reader in finding at least the generic name of the more common organisms which the author has collected from a single pond in New Jersey. Special attention has been devoted to certain groups—*e.g.* Gastrotricha, Rotifera, Polyzoa. Here and there the desire to be non-technical in terminology has been carried a little too far—*e.g.* the egg-masses of Cyclops should not be called "external ovaries," and the term "contractile vesicle" is not a good substitute for "contractile vacuole"—the latter term could have been quite easily defined. Helpful illustrations (198) as aids in diagnosis of the genera are given, but we would suggest that when the book reaches a fifth edition figures should be added of some of the commoner transparent animals, *e.g.* a rotifer, a polyzoon, Daphnia, in which the chief internal organs are clearly shown and labelled.

OUR BOOKSHELF.

The Elements of Astronomy for Surveyors. By Prof. R. W. Chapman. Pp. x+248. (London: C. Griffin and Co., Ltd., 1919.) Price 5*s.* net.

SIR JOHN HERSCHEL's dictum in his well-known panegyric on star-catalogues, that "every well-determined star from the moment its place is registered is as effective for mapping down the intricacies of a petty barony as for adjusting the boundaries of transatlantic empires," may be taken as the *raison d'être* of this book. The author is professor of mathematics and mechanics in the University of Adelaide, and doubtless the southern continent gives scope for surveying on a large scale in which astronomical observation is a necessity.

The book is on conventional lines, the first six chapters dealing with the elements of geometrical astronomy, including one which explains at some length with examples the conversion of sidereal into mean time and similar arithmetical processes. The latter half of the book consists of chapters on the determination of true meridian, on azimuth of a mark, of latitude, time, and longitude. Most of the recognised methods are concisely explained, and illustrated in some cases by examples taken from actual experience. Use is made of the observation of circumpolar stars at elongation for determination of azimuth, and for time the observation of altitude of the sun or a star near the prime vertical is recommended and discussed in full detail. The inclusion of a few pages on the almucantar is a useful addition to the book, which will fulfil its intended purpose of providing an elementary exposition of the principles of the formulæ used by the surveyor.

Organic Chemistry for Students of Medicine. By Prof. James Walker. Second edition. Pp. xi+332. (London: Gurney and Jackson; Edinburgh: Oliver and Boyd, 1919.) Price 10*s.* 6*d.* net.

THIS second edition of Prof. Walker's book for medical students does not differ substantially from the first edition as issued in 1913. It may, however, be useful to direct the attention of medical students and their teachers to a volume which has been written specially to suit their requirements, and the value of which is shown by the publication of a further issue.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

Promotion of a Plumage Bill.

ALL lovers of animals must sympathise with any efforts to prevent the ruthless destruction of bird-life for trade purposes, referred to by Mr. H. J. Massingham in his letter in NATURE of December 25. It is open to grave doubt, however, whether the measures announced are the best that can be devised or will meet with a sympathetic following. They are the formation of a "Plumage Bill group," designed to fight the plumage trade and to bring pressure upon the Government to introduce a Bill forbidding the importation of all birds' skins for millinery purposes, with a few exceptions.

From time immemorial plumage has been employed to satisfy the decorative and æsthetic instincts of mankind, though to-day public opinion is rightly determined that it must be procured under conditions conforming with our humane sentiments. We may well inquire, therefore, whether the æsthetic demands for plumage can be met without outraging these. The ostrich in South Africa supplies a forcible case in point. In times past the wild bird was hunted for its precious plumes, and would have become almost extinct ere this had not its domestication been undertaken. As it is, the wild bird is now preserved and is increasing in numbers, and hundreds of thousands of domesticated birds lead a pampered existence on the ostrich farms. A big industry has arisen of the highest importance to agricultural South Africa, representing in pre-war days an annual export value of about 3,000,000*l.*

It is submitted that what has been accomplished with the ostrich may be possible with other birds supplying ornamental plumage; that, like it, others may give rise to industries and yield their plumage in conformity with the highest humane demands. One ventures to suggest that, instead of pursuing a repressive policy, the efforts of Mr. Massingham and his associates would be better directed in instituting studies and investigations as to conditions under which plumage-birds could be reared on an industrial basis.

Mr. Massingham appears to have an unworthy view of the issues involved in his announcement, for in the plumage trade he sees "no other purpose than to feed the profits of a small band of East End traders and to satisfy the frivolity of some women." Though ostrich plumes are exempted from the operations of the proposed Bill, yet so sensitive is the inter-relationship

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between plumage of all kinds that when the Anti-Plumage Bill was introduced in 1913 the trade insecurity engendered was so far-reaching as to constitute one of the principal causes of the serious slump in the South African ostrich industry, involving the loss of millions of pounds—a slump from which, the war supervening, the Union is only slowly recovering. The introduction of another Bill would be viewed with alarm in South Africa, and would have a serious international bearing, particularly upon our Ally, France, involving thousands of workers and millions of capital. It surely were wise not to attempt it when other measures are possible which would afford a wide stimulus to industry and to the study of bird-life.

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Musical Drums with Harmonic Overtones.

It is well known that percussion instruments as a class give inharmonic overtones, and are thus musically defective. We find on investigation that a special type of musical drum which has long been known and used in India forms a very remarkable exception to the foregoing rule, as it gives harmonic overtones having the same relation of pitch to the fundamental tone as in stringed instruments. Five such harmonics (inclusive of the fundamental tone) can be elicited from the drumhead in this type of instrument, the first, second, and third harmonics being specially well sustained in intensity and giving a fine musical effect. The special method of construction of the drumhead which secures this result will be understood from the accompanying illustration (Fig. 1). It will be noticed (1) that the drumhead carries a symmetrical distributed load, decreasing in superficial density from the centre outwards (this appears as a dark circle in the middle of the membrane, the load consisting of a firmly adherent but flexible composition, in which the principal constituent is finely divided metallic iron); and (2) that a second membrane in the form of a ring is superimposed on the circular membrane round its margin.

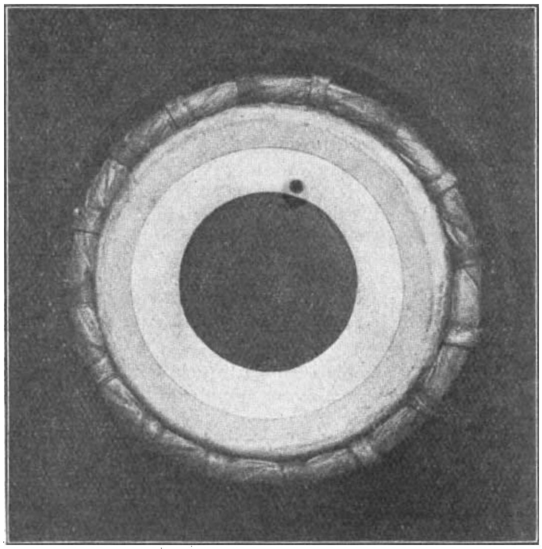

Fig. 1.—Drumhead giving harmonic overtones.

The character of the vibrations of this heterogeneous membrane which give rise to its remarkable acoustic properties have been investigated by us. It is found, as might have been expected, that the fundamental pitch and the octave are derived respectively from the modes of vibration of the membrane without any nodal lines and with one nodal diameter. The third harmonic, we find, owes its origin to the fact that the next two higher modes of vibration of the drumhead (those with two nodal diameters and with one nodal circle respectively) have identical pitch, this being a twelfth above the fundamental. There is reason to believe that the fourth and fifth harmonics similarly arise from some of the numerous more complex modes of vibration of the drumhead becoming unified in pitch in consequence of the distributed load at the centre and round the periphery of the membrane. The central load also improves the musical effect by increasing the energy of vibration, and thus prolonging the duration of the tones.

C. V. Raman.
Sivakali Kumar.

210 Bowbazaar Street, Calcutta, India,
December 10.

Power from the Sun.

Mr. A. A. Campbell Swinton, in his letter on the above subject in Nature of December 18, states that "it is hopeless to expect to be able to effect anything of this nature with the heat-engine, for with this we should scarcely reach the 2 per cent. efficiency nearly attained by vegetation."

For nearly four years immediately preceding the war I was engaged by the Sun Power Co. (Eastern Hemisphere), Ltd., and the Shuman Engine Syndicate, Ltd., on the problem of the utilisation of solar energy, upon which these companies spent a considerable sum of money, the experiments being conducted on a large scale in America and Egypt, while the trials of the necessary low-pressure engine (which made an easy record for such engines) were made in this country. The results of the whole of this work are recorded in my two papers both bearing the title "The Utilisation of Solar Energy," one being read before the Society of Engineers in April, 1914, and the other before the Royal Society of Arts in April, 1915.

At p. 540 of the Journal of the Royal Society of Arts of April 30, 1915, it was shown that the overall thermal efficiency of the sun power plant erected in Egypt was 4·32 per cent., which is to be compared with the performance of the best steam-engine and boiler of 11·5 per cent. At p. 560, *ibid.*, it was shown that the theoretical efficiency of an engine working between the same limits of temperature would be 5·9 per cent., and that, consequently, the relative efficiency of the sun power plant to this ideal engine was no less than 73·2 per cent. From this it will be seen that Mr. Campbell Swinton's estimate of the thermal efficiency of 2 per cent. for a sun-power steam plant is more than 100 per cent. too low.

It is well that any wrong impression which the lower figure might give should be corrected, for in these days of extremely expensive coal it is desirable that inventors, experimenters, and financiers should not be discouraged from attempting to utilise solar energy, which some of us think is bound to be realised in the future. In the Royal Society of Arts paper it was shown that the cost of solar energy was equivalent to coal at 3*l.* 10*s.* a ton, and from this it is obvious that had the companies had more time in which to develop and construct plants before the war, they would have been paying handsomely, with coal at its present prices, in Egypt, Chile, and other sun-bathed countries.

Alfred S. E. Ackermann.

25 Victoria Street, Westminster, S.W.1,
January 6.

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